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GRAPE GROWING IN MASSACHUSETTS

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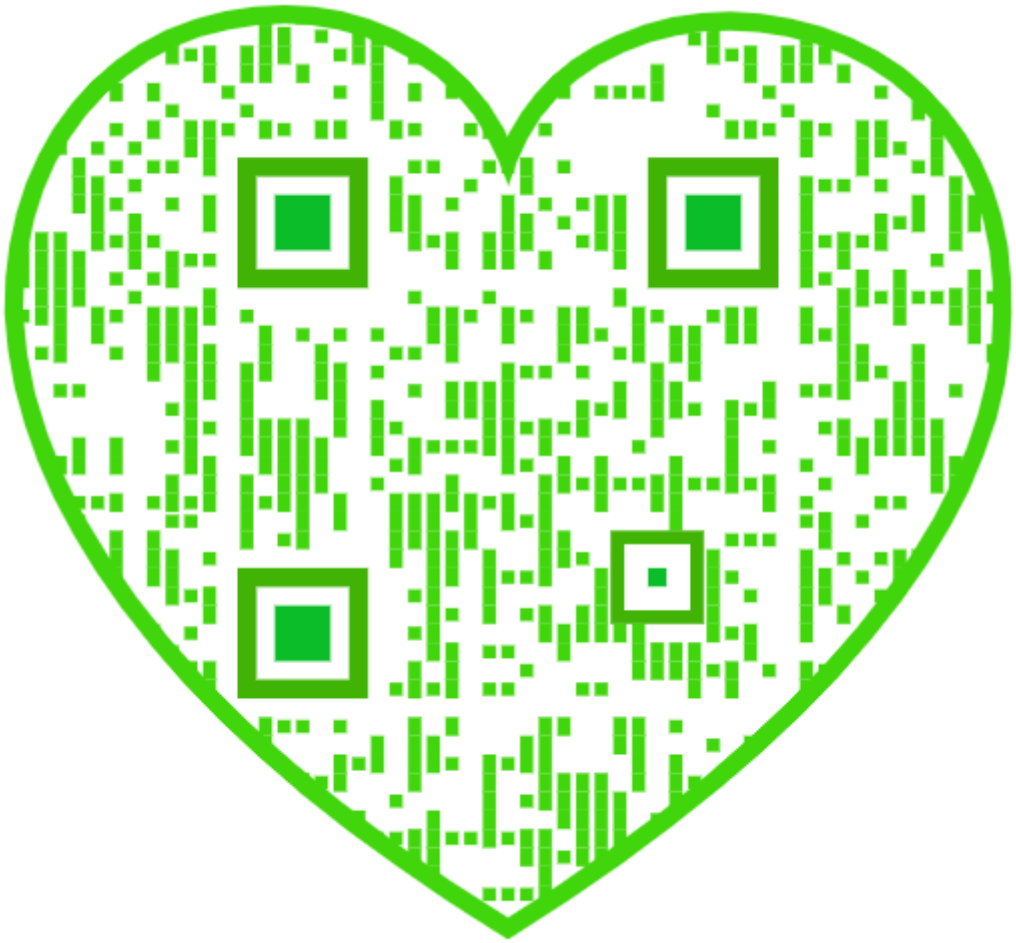

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GRAPE GROWING IN MASSACHUSETTS.

There would seem to be no adequate reason for the very small amount of grapes grown in the State of Massachusetts. While we do not have the conditions to warrant the extension of the industry as it is developed in parts of New York, Pennsylvania and Ohio, yet many more grapes might be profitably grown for market, and few home gardens are so small as not to allow room for from one to a dozen grapevines.

As a commercial venture a small vineyard of an acre or two would prove a profitable investment in the neighborhood of almost any of our larger villages or towns. We do not ordinarily think of Franklin County, for instance, as being in the best grape-growing section of the State, yet the writer is acquainted with one grower in the town of Greenfield who grows as fine grapes as can be found anywhere in the State, and who sells his surplus for fancy prices because of their extra quality. A vineyard of an acre or two producing such fruit would easily give a man a fair income. And in the eastern end of the State, where conditions are more favorable, a good commercial vineyard would certainly make a valuable part of the producing plant of any farm which had a good site within its borders.

If we consider the home vineyard instead of the commercial one, there is even more to be said in its favor. Grapes are easily grown, do not require much room, are very ornamental, both as vines and fruit, and are delicious and wholesome to eat. What more could be asked of any fruit! Yet most of our people persist in buying their grapes, and usually, through force of circumstances, buy stuff which has been shipped in from New York or Pennsylvania. Such fruit when it arrives in our markets is not nearly so good in quality as might be grown right in the home garden, and one loses, besides, the pleasure and pride of the achievement of growing what the family needs.

Viewed from the standpoint of the State as a whole there is the added argument that we annually pay out thousands of dollars to growers outside of the Commonwealth, which we might, with a little more enterprise, keep at home to enrich our own people.

There would certainly appear to be an opening for a campaign with the slogan, "Grow more grapes in Massachusetts!"

If the soundness of the foregoing be admitted, and if we are to grow more grapes here, the following suggestions are offered as worthy of consideration by the man who attempts to enlarge the vineyard industry of the State, whether he narrows his efforts to one vine or expands them to 10 acres.

The Site.

One of the most common obstacles to successful grape growing in Massachusetts is lack of sufficient heat for the entire growing season, from May to September, inclusive. This is, of course, especially true of the western end of the State, but it is likely to be true in any part if one attempts to grow some of the late-ripening varieties. One ought, therefore, to consider this point very carefully in choosing the site of the vineyard, and two factors in particular would influence this question of heat, — one, the exposure or the direction of the slope of the land, and the other, the type of soil.

It often happens, of course, that there is but little choice possible in the selection of the spot for the vineyard, and this is especially true of the home vineyard, where there is usually but little land available and the grapes must be grown in a part of the garden. Where, however, one can exercise some choice in selecting the site the following items should be considered: —

1. *The Slope of the Land.* — This should preferably be towards the south or southeast, and the more difficult it is to ripen grapes before frost, the more important this item is. In Berkshire and Franklin counties, for example, it would be imperative; in parts of Plymouth and Essex counties it might be ignored.

2. *The Soil.* — For best results this should be a medium soil, neither too heavy nor too light; but if either extreme has to be used, the soil that is too light is much to be preferred to that which is too heavy,

since a warm soil promotes growth and hastens maturity, and one is therefore more likely to bring the grapes to the desired stage of ripeness before they are caught by early frosts. On the other hand, too light a soil does not give the high quality to the fruit that a medium or a fairly heavy soil does. Some gravel in the soil is also very desirable, partly because it makes the soil warmer than it otherwise would be, through the heat absorbed by the gravel, and partly because it improves the drainage, which also raises the soil temperature, as well as improving the soil in other ways. On the whole, and for most varieties of grapes, a gravelly loam is perhaps the ideal soil, though if one has several types of soil available and is setting several varieties of grapes, he may well place his varieties according to their soil preferences, putting such sorts as Delaware and Moore's Early on the more fertile sections, and Concord, Niagara and Worden on those that are less fertile.

3. *The Elevation of the Site above the Surrounding Land, and any Other Factors which might influence the Frostiness of the Spot.* — Grapes are very tender, the slightest frost injuring the foliage and a fairly heavy frost damaging the fruit, so that autumn frosts are much more to be feared than with most other fruits. Even peaches will bear some frost in the autumn without being affected, but grapes, even those that are hardiest in the vine and will endure severe winter weather, will be damaged by a frost.

It is therefore desirable to study this element and endeavor to avoid a spot that is at all frosty. A slope should be selected that will carry off the cold air (and a very slight slope will do this), and if possible this slope should extend some distance below the vineyard to insure that the cold air does not collect on the lower part of the vineyard and cause a frost there.

The more abrupt the elevation is, the more strongly it will influence this matter of frostiness, and a fairly steep elevation of even 25 to 50 feet is often sufficient to prevent the frost from occurring, when on the lower lands there may be quite a severe frost.

A near-by stream of water is also very effective, since it not only provides a lower level on to which the cold air can drain, but the slope of the land down which the stream is flowing, and the movement of the water itself, will help to carry off the cold air. A pond or lake of any size is also very helpful in preventing frosts.

Establishing the Vineyard.

In preparing the soil for setting the vineyard two considerations in particular ought to be kept in mind: first, to stir the soil as deeply as possible, and second, to pulverize it thoroughly. Methods of doing either will vary greatly, depending on whether one is setting a few vines for home use or a commercial vineyard. In the preliminary stirring of the soil a plow is, of course, the most common implement to

Fig. 1. — A good Massachusetts vineyard on a good type of grape soil.

use, and it is best to have a fairly good-sized one, preferably not less than a 12-inch one, and to plow the land not less than 7 inches in depth and preferably 8 or 9. This last is rather deep plowing, but it will pay to have the soil stirred deeply, since it can never again be so thoroughly worked.

Following the plow one should use whatever harrows may be available, beginning with the disc harrow (which should be used at least three or four times and kept going until the soil is thoroughly cut up) and end-

ing with the smoothing harrow or the planker. No amount of after work can make up for poor preparation before the vineyard is set.

The land is next staked off for setting the vines. In small vineyards the rows and the vines in the rows are all set at uniform distances. Eight or 9 feet apart for the rows, with the vines from 6 to 8 feet in the rows are common distances. Where larger acreages are set to single varieties it is sometimes the practice to put small growing sorts, like Moore's Early, closer together than large growing sorts like Worden or Niagara.

If possible the direction of the rows in the vineyard should be at right angles to the slope of the land in order to reduce as much as possible the washing of the soil. On the other hand, when the greatest amount of heat is desired some other direction may be better, a north and south direction being best in closely planted vineyards, while east and west is best in a vineyard with wider distances.

The marking off of the vineyard for setting is accomplished in various ways. In large blocks, and where great accuracy is not to be insisted upon, a marker drawn by a team may be used and the land marked both ways. Where greater accuracy is desired, and in small plantations, it is best to set a stake at either end of each row and then establish a stake in the row at the point where each vine is to stand.

Holes are usually dug for the vines, though in large operations a plow may be used to furrow out the land after it has been marked in one direction, in which the vines are then set at the points where the marks and the furrows intersect.

A medium-sized hole is all that is necessary if the land has been well prepared, and one 12 inches wide by 12 deep is usually ample. In digging it, the first 6 or 8 inches of soil should be put in one pile and the subsoil in another, so that one may use the surface soil about the roots of the little vine when it is set, and thus give it a more fertile soil in which to start growth.

Strong one-year vines are usually preferred to two-year vines, since the nurseryman sells his best vines at one year, and keeps over, as a rule, only those vines that are too small to be of marketable size.

In setting the young vines the roots should be cut back severely, leaving perhaps 6 or 8 inches of the root system, and after setting, the

top is cut to two buds on a single cane. This is severe pruning, but that is what the grape needs to do its best, not only when set but all through the life of the vineyard.

There are no special precautions in the setting of a grapevine. The roots should be spread out in the hole and the soil tramped in firmly about them so that they may take hold and start quickly. Care should also be taken to see that the vine is set at least as deeply as it stood in the nursery and perhaps a little deeper.

FIG. 2. — A three-gang vineyard and orchard plow, — one of the most useful implements in such plantations.

Care of the Vineyard.

After the vines are set and pruned the new vineyard will require only good culture for the rest of the season, beginning just as soon as possible, and continuing up to about the middle or last of July, when the land should be sown to a cover crop. Each year thereafter the land should be plowed as early as possible in the spring, cultivated thoroughly, and again seeded to a cover crop. For this annual plowing the small three-gang plow shown in Fig. 2 is very satisfactory, and if

the vineyard is large enough, or if the farm on which the vineyard is set has other fruit plantations, it may pay well to buy one.

Thorough cultivation is absolutely essential if the vineyard is to do its best, and this becomes more important if the land is infested with such serious weeds as witch grass.

For a cover crop buckwheat or barley, sown at the rate of a bushel to a bushel and a half per acre, will give excellent results; 5 or 6

FIG. 3.—A cover crop of buckwheat in a vineyard. This is one of the best crops to use for this purpose.

pounds of crimson clover may be used with either of these crops, and the amount of buckwheat or barley somewhat reduced. This crop is allowed to stay on the land until the following spring, when it is plowed under to add humus and fertility to the soil.

In the fertilizing of the vineyard the principal thing is to keep the vines growing well but not too vigorously. Of course the amount and kind of fertilizer necessary to do this will vary tremendously with the

natural soil conditions and the previous treatment of the land. A moderate application of barn manure is an excellent beginning. If this is not available nitrate of soda may be used, and on average soils 200 to 300 pounds per acre may be applied, or, for home vineyard, an ounce for a young vine and 3 or 4 ounces for a mature vine. Other fertilizers are often used and may very likely benefit the vineyard, but results from experiments are conflicting. Next to nitrogen, hardwood ashes are perhaps as commonly used as any fertilizer, and are as likely to give good results as any other form, since they carry some lime and potash, both of which are thought to be useful on vineyards. An application of one-half to 1 ton per acre, or, on family vineyards, 3 or 4 pounds per vine, is the common amount used.

The trellis is usually built at the end of the second or the beginning of the third year. The principal item in a good trellis is to have strong end posts, set deeply (3 feet) and well braced, so that they will not give under the weight of the wires and the vines. The braces should be placed low on the posts so that they will not have a tendency, under the pull of the wires, to raise the posts.

The wires are two or three in number, depending on the system of training to be used. A No. 9 wire is best where the strain is greatest (as in the top wire of the four-cane Kniffin system, and the bottom wire of the High Renewal system), with a No. 11 or No. 12 where the strain is less.

After the wires have been strung along the row they should be drawn taut and fastened to the end posts by wrapping around the post twice and then bending the end back around the wire itself to hold it. Do not staple the wire to the end post, as it must be taken off every spring to tighten it. The wires are fastened to the other posts by staples which should not be driven in tightly but left loose enough so that the wires may be drawn through at this annual spring tightening.

Varieties.

The choice of varieties is always a question of vital importance in determining the success of the vineyard, and incidentally it is one of the most interesting and fascinating. Shall one set Concord or Worden; Green Mountain or Moore's Early; Brighton or Herbert?

As commercial varieties for Massachusetts vineyards some six or

seven varieties stand out fairly distinctly as much more generally successful than any others, and a brief description of these leading varieties may be given first. In addition to these there are many others which may profitably be included in the home vineyard, though as a matter of fact practically all of these commercial leaders are also strong candidates for favor in the family vineyard.

Arranged roughly in the order of their ripening these seven leading commercial varieties are as follows: —

1. Moore's Early. — This is a black grape in many respects much like the Concord, though the bunches are smaller and the vines not nearly so productive. The fruit is ripe usually at least three weeks before Concord, which brings it on the market at a time when there is a good demand at good prices, since the consumer has had no grapes for so long a time that he is less critical than he becomes later in the season. Moreover, the Moore's Early is by far the best black grape of its season, so that the grower who has them for sale has a very distinct advantage over the one who is growing Ives or Champion, both grapes of very low quality.

The vines of Moore's Early are small-growing and early-ripening, the leaves ripening off and falling before any of our other common varieties. This insures its going into the winter in a well-ripened condition, and it is therefore very hardy, succeeding almost anywhere that grapes can be grown at all.

The clusters are only fair in size and shape, and the quality medium, as is likely to be the case with early fruits of any class.

2. Green Mountain or Winchell. — This is a green variety and ripens very shortly after Moore's Early, and sometimes at the same time. It is thought to have a strain of the European grape in it, which takes away any foxiness of flavor and gives it a very pleasant sweet taste. But it does not carry the sprightly, vinous flavor which most hybrids of the European grape have; in fact, though its flavor is sweet and pleasant it is rather lacking in character.

The berries are small and thin-skinned, and the bunch is loose and not very large, so that it is not by any means an ideal market grape; but it certainly ought to be in every home vineyard, and it is an excellent variety, along with Moore's Early, to start the season in a commercial vineyard.

The vines are healthy, productive and hardy, leaving little to be desired in this respect.

3. Delaware. — This is so well known as to need very little discussion.

It is usually ranked as the very best of our American varieties, and is certainly a most delicious grape.

The vines are very hardy and very productive, and it succeeds well over a wide range of soils and climates, so that one can plant it with a very reasonable expectation that it will produce results. It probably stands next to Concord as a general favorite for home and market vineyards, and for our Massachusetts growers it has this advantage over Concord, that it is early enough to be almost certain to ripen, while Concord is likely to be caught by early frosts in many parts of the State.

The small size of both the berries and the clusters, and the small, slow growth of the vines, are its chief shortcomings, and, along with the susceptibility of the foliage to mildew, make it sometimes less profitable than some much poorer quality grapes like Niagara. But its high quality already mentioned, and the fact that it keeps and ships remarkably well, make it sure of a place in every vineyard, large or small.

4. Worden. — The Worden is a seedling of the Concord and resembles it in many respects, being the best of all the Concord seedlings. It has several advantages over the Concord, the chief ones being that it has larger berries and bunches, is considerably better in quality, and it ripens a week or ten days earlier. This last point is of especial importance with growers in the western part of the State because Concord frequently does not ripen well.

The vine is hardy, healthy, vigorous and productive, being nearly ideal in this respect, but it is more particular as to soil and other conditions than Concord, and is therefore by no means as generally successful as that variety.

The fruit of the Worden has three rather serious faults, especially from the standpoint of the commercial grower. The first and most serious of these is the tendency of the berries to crack, particularly when a fairly dry spell of weather is followed by abundant rains. This not only causes injury in itself, but it allows the bees to gain an

entrance into the berries which they are very quick to do, and often whole clusters are practically ruined in this way. The second fault is the tendency to shell, the berries dropping off the stems sometimes in a very few days. This is a serious fault for the distant market, but for home use or local market, where the fruit is not to be held long, it is not a serious matter. The third fault is the softness and tenderness of the berries, causing them to break easily when packing into baskets and not to keep as well as a grape with a tougher skin.

On the whole, however, the Worden is a very fine variety, and ought to be included in any home vineyard or in commercial vineyards for local markets.

5. Brighton. — This variety is a red grape and, like the Delaware, is a cross between our common fox grape and the European grape. It has much of the fine quality that is likely to result from any admixture of European blood, and is one of the very finest grapes for the home vineyard. It also ranks well for the commercial vineyard, though it does not stand quite so high for this purpose as for home use, largely because it deteriorates very quickly in quality. This characteristic, and the fact that the blossoms are largely self-sterile, requiring to be cross-fertilized with the pollen from some other variety in order to bear fruit, are its two most serious faults, and have prevented its gaining the popularity as a commercial variety that it otherwise would. On the other hand, the vines are hardy, vigorous and productive, and the clusters are large and very handsome, which with its high quality make it a profitable grape for the local market and a very desirable one for the home vineyard. Of the forty or fifty varieties in the college vineyards the Brighton is easily the most popular with consumers. Its season is a little earlier than the Concord.

6. Niagara. — The Niagara is a large and very handsome variety, and is undoubtedly the leading American white grape for market and perhaps for the home vineyard. The vines are vigorous and productive, and the bunches so large and showy that it is sure to command a ready sale.

On the other hand, the quality is only medium, and in spite of the fact that it has some European blood it has a very distinct, and at times rather a strong, foxy odor and flavor, so that those who are critical as to quality are not likely to be enthusiastic about it.

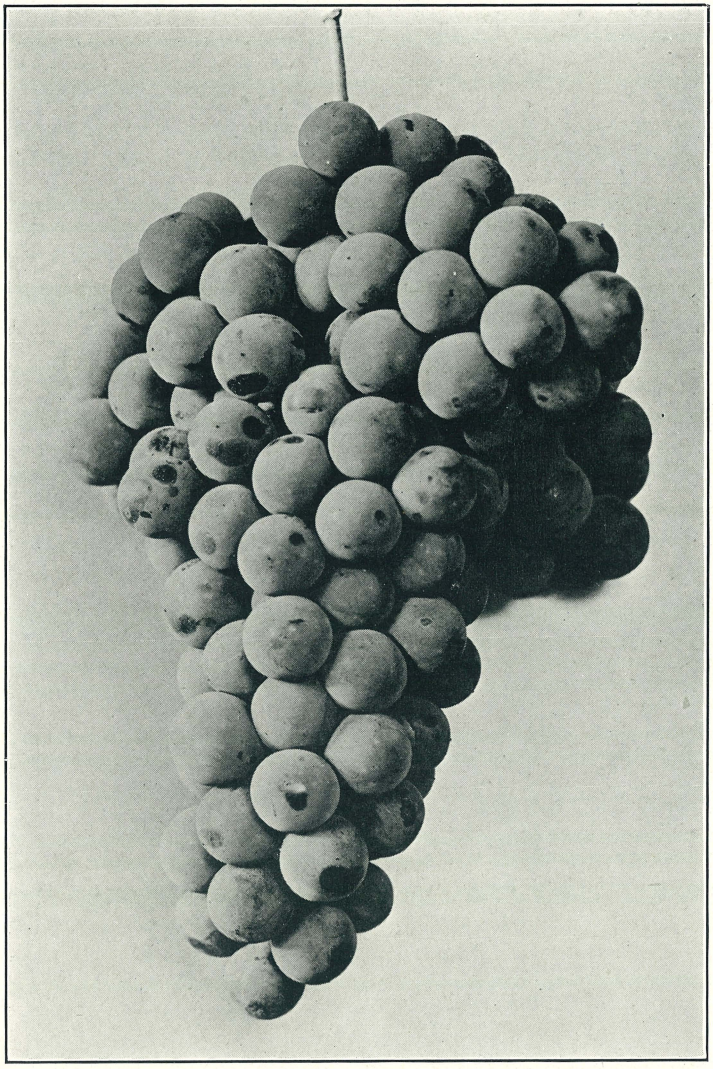

FIG. 4.—A cluster of Brighton grapes. This is one of the finest varieties for either home or local markets.

The vines are reasonably hardy, though it is not equal in that respect to the other varieties here described. It will, however, withstand the winters in most parts of the State, though it might need winter protection in some of the colder sections.

It ripens about with Brighton and a little before Concord.

7. Concord. — This variety is so well known, and has been used so frequently in the foregoing discussions of other varieties, that but little need be added. It originated at Concord, Mass., and is one of the most remarkable varieties of any fruit in its marked success over a wide area of country and under many different conditions.

The vine is vigorous, hardy, very productive and is comparatively free from the attacks of fungus and insect enemies; in fact, there is little to be desired, so far as the vine is concerned, for our Massachusetts vineyards.

But the fruit is not by any means ideal, though it is good, and many would doubtless call it excellent. Compared with some of the other varieties here discussed, however, it is considerably inferior in quality. Delaware, Brighton and Worden in particular are decidedly better than Concord. It lacks the rich, sprightly flavor of these and many other varieties, while it has a good deal of the foxiness so distasteful to many persons. The berries also shell badly, the skin is likely to crack, and it loses quality rather quickly, much more so than Delaware, for example.

In addition to these seven leading varieties the following are worthy of mention as varieties which might be included in the family vineyard, and in some cases, in a small way, in the commercial vineyard.

1. Herbert. — This is one of the so-called Rogers' Hybrids which were originated by E. S. Rogers at Salem, Mass. It is one of the finest of dessert grapes, the berries being large and black, with a delicious vinous flavor. The vine is vigorous and productive.

2. Agawam. — This is another Rogers' Hybrid. Not so good as Herbert, but still a fine grape; berries dark red and flavor good, though there is a slight foxy taste. Ripens a little after Concord.

3. Barry. — Another Rogers' Hybrid, black, fine flavor, good keeping quality; vine vigorous, hardy and productive. Season a little later than Concord.

4. Campbell Early. — An early black grape of fine quality. Often

profitable as a market sort. Vines hardy but not productive. Ripens two weeks earlier than Concord.

5. Diamond. — A beautiful white grape of fine quality. Vine hardy, productive and vigorous. A good market grape in many sections. Ripens a little earlier than Concord.

6. Gaertner. — Another Rogers' Hybrid. Vine vigorous, hardy and productive. Berries large, red, handsome, of fine quality. Ripens unevenly, about ten days before Concord, and ships poorly, but may well be included in the home vineyard.

7. Lindley. — Still another Rogers' Hybrid. Vine vigorous, fairly hardy, susceptible to mildew. Berries large, dark red, fine quality. A favorite for the home vineyard. Ripens a week or ten days before Concord.

8. Moyer. — Much like Delaware, its parent. Ripens two weeks earlier. Good for the colder parts of the State. Fruit keeps and ships well.

9. Salem. — Another Rogers' Hybrid. Vine vigorous, hardy and generally productive, though not always. Subject to mildew. Berries large, dark red, fine in quality. A good market sort where it succeeds well. Ripens a little earlier than Delaware.

10. Wyoming. — A small red grape of fine color, good clusters, only fair in quality. Vines very hardy, free from disease and productive. Another variety that is worth setting in the colder parts of the State. Ripens about a week before Delaware, but keeps very well.

Pruning and Training.

A question which ought to be settled early, and which is usually decided before the vineyard is set, is the problem of what system of training shall be adopted. Many different methods of training are used (and many vines are grown without any method either of training or pruning), but in a brief discussion like the present we may perhaps narrow the discussion down to three which seem particularly adapted to the home vineyard, but which are also used largely in commercial vineyards.

High Renewal System. — The first of these systems is the High Renewal, which is well shown in Figs. 5 and 6. Just why it is called "high" has always puzzled the writer, since in reality it is one of the

very lowest types of training used. The system is very simple indeed, the vine when pruned consisting of a central trunk or stump perhaps 18 to 24 inches high, and one cane about 3 feet long on either side. Each annual pruning consists in cutting away all of the top of the vine except this one cane on either side, selecting in each case a strong

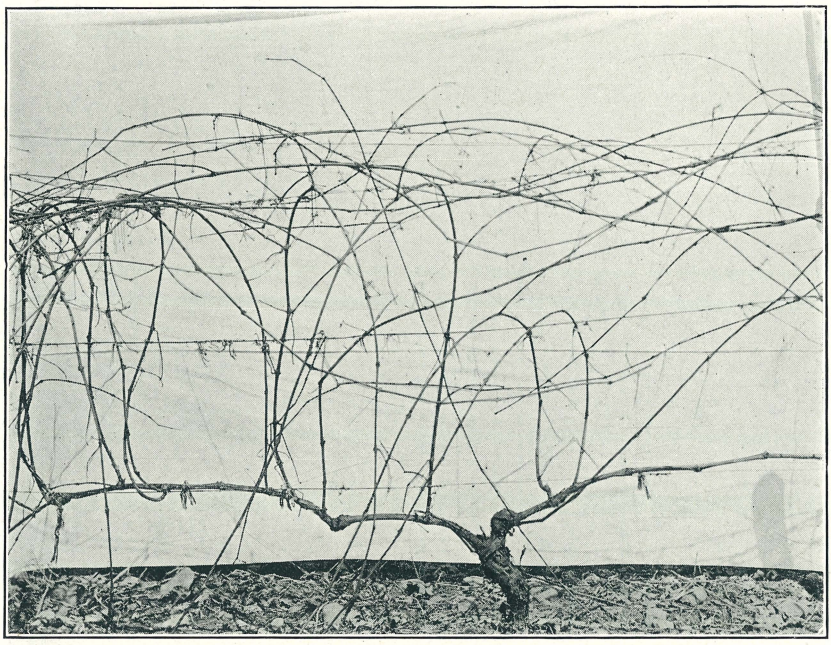

FIG. 5. — A grapevine trained on the High Renewal system. This is one of the best systems for Massachusetts. See Fig. 6.

cane that is as near as possible to the main trunk. These two canes are then tied down to the lower wire (as shown in Fig. 6). The new shoots from the buds along these canes are tied up to the other two wires, the first tying being done when the shoot is long enough to reach perhaps 6 inches or a foot beyond the wire, so that the point of the shoot where the tie is made will not be too tender. And in the same way the second tying is done when the shoot is long enough to reach somewhat above the upper wire. This tying is one of the most

serious objections to the High Renewal system, because it cannot be done in each case until after the shoots have grown considerably beyond the next wire, and yet if the shoots are allowed to grow too long before tying, their tendrils fasten on to the wires and on to other shoots and canes so that it is a serious task to pull them loose, thus adding expense to an already expensive process. Moreover, in addition to the actual work and expense of this tying, one must keep the matter constantly in mind in order to do the tying at the proper time,

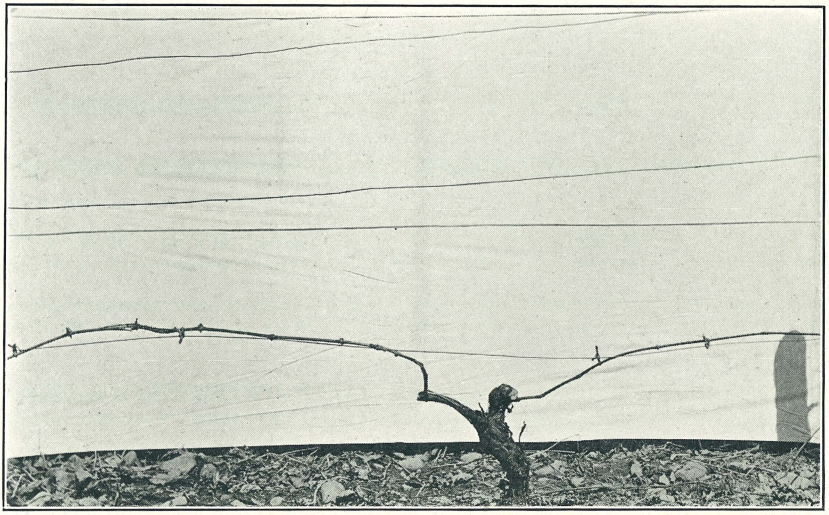

Fig. 6. — Same vine as shown in Fig. 5, after pruning and tying.

and this in itself is an objection. On the other hand, one can grow as fine grapes on this system of training as can be grown on any system, and the fruit is borne low where it gets all the heat there is, so that it is more certain to ripen than perhaps on any other system. It is also a very simple system to prune. The good points of the system, therefore, are far more important than its shortcomings, especially under the conditions which obtain in Massachusetts.

The trellis for this system consists of three wires, — the first, 20 to 24 inches from the ground, and the second and third, at distances of 18 to 20 inches apart.

In starting a young vine on this system the longest and best cane available is selected and is carried directly to the lower wire and then bent sharply to the right or left and tied along this lower wire. One thus has an arrangement of cane similar to half a mature vine, as shown in Fig. 6.

Four-cane Kniffin System. — The second system is the Four-cane Kniffin system, and is illustrated by Figs. 8 and 9, showing the same

FIG. 7. — A young vine grown on the High Renewal system.

vine before and after pruning. A vine trained on this system is pruned so as to assume a double T, there being a central trunk which is carried directly to the upper wire, and two canes being taken out on each of the two wires, those on the lower wire being about 18 inches in length, and those on the upper wire about twice that length.

The annual pruning with this system will consist in removing all of the growth from the vine except these four canes, and in selecting the canes to save, one is guided by two considerations: first, that the cane in each case should be as near the main trunk as possible, and second,

that it should be a reasonably vigorous one. While these rules are very simple it is not always easy to apply them, since the most vigorous canes are apt to be those which are farthest from the trunk instead of nearest to it. This is where one requires judgment in pruning on this system. But the vines usually bear well when pruned on this method, and it has the especial advantage that once the vines are tied up in the spring no further attention is needed on this point till the following spring.

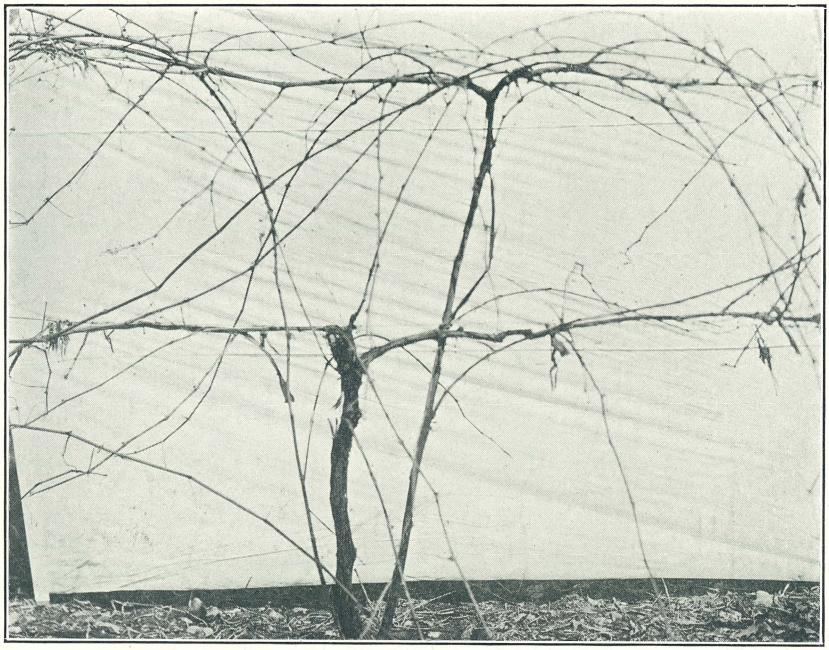

FIG. 8. — Grapevine trained on the Four-cane Kniffin system. In this case the vine has two trunks, one of which should be removed, as shown in Fig. 9.

The trellis for this system consists of two wires, one $3\frac{1}{2}$ feet and the other $5\frac{1}{2}$ feet from the ground.

In starting a young vine on this system, which is not usually done till a cane at least 6 feet is available, the cane is carried to the upper wire, tying it at both wires, and is then bent sharply to the right or left and tied along the wire.

Umbrella System. — The third system is the Umbrella system, which is not illustrated. In this system there is a main trunk which is usually carried up to the upper wire though not necessarily so. It is tied to the lower wire and to the upper wire if it reaches it. From the upper end of this trunk are taken each year two canes, one on either

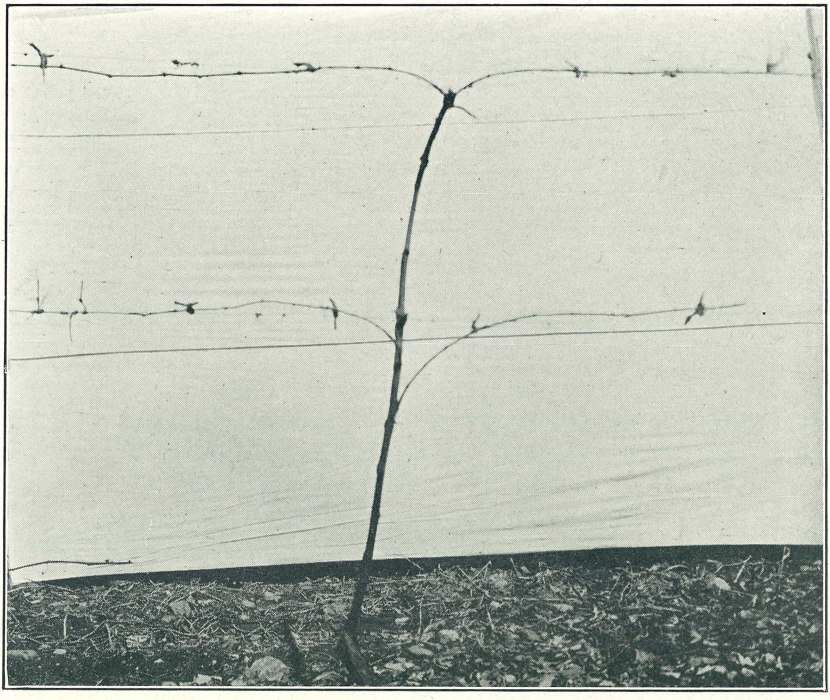

Fig. 9. — Same vine as shown in Fig. 8, after pruning and tying. Note that one of the trunks has been removed.

side, which are long enough to extend in a curved direction from the upper wire down to the lower wire at a point about 3 feet from the trunk, which would mean a cane of about 4 feet in length. Tying in this curved position usually results in the buds along the cane starting more uniformly than is the case in either the High Renewal or the Four-cane Kniffin systems, and this is one of the principal advantages of the system.

The trellis for this system consists of two wires only, the lower one $2\frac{1}{2}$ feet from the ground, and the upper one 4 feet.

In starting a young vine on the Umbrella system, which is usually done the third year, the longest cane available is taken and is carried directly to the upper wire where it is tied, being also tied to the lower wire. It is then bent outward and downward and the end tied to the lower wire at a point about 3 feet from the upright part of the vine.

Spraying.

It is not the province of a brief discussion like the present one to enter into any extended discussion of the diseases and insect pests of the grape. Among the most serious of the former are the following: —

1. Mildew. — There are two forms of this, both of them attacking the leaves, shoots and berries. They are perhaps most conspicuous on the leaves, causing a downy or powdery appearance, but both are also very destructive to the fruit.

2. Black Rot. — This disease attacks all parts of the plant, but is most conspicuous on the fruit, where it causes the berries to dry up and turn black.

3. Anthracnose, like the others, attacks all parts of the vine. It is most conspicuous on the fruit, where it produces peculiar spots made up of concentric rings.

All three of these diseases can be largely controlled by proper methods. To begin with, all diseased parts, including leaves, fruit and canes, should be destroyed wherever these diseases are troublesome. In addition, the vineyard should be sprayed thoroughly, with Bordeaux Mixture (4-4-50). The first spraying should be made just before the blossoms open, and a second one shortly after the blossoming period. In most cases these two applications will be entirely effective, but in bad cases a third and perhaps a fourth spraying may be necessary at intervals of two or three weeks.

Only two insects are likely to be troublesome in the vineyards of Massachusetts, though several others are likely to occur. These are the rose chafer and the leaf hopper.

The rose chafer is a beetle of about a third to a half inch long, yellowish brown in color, with long awkward legs. It often appears in

countless numbers on grapes and many other plants, stripping the plants of foliage in a very short time and doing very serious damage. It is likely to be most troublesome on sandy soils. In the larval stage the insect feeds on the roots of grasses, passing the winter in this stage and doing some feeding the following spring before it goes into the pupa stage in cells not far below the surface of the ground. From these cells it emerges about the middle of June and begins feeding. Three methods of attack are thus open: —

(1) All grasslands near the vineyard should be plowed up and planted to cultivated crops, thus destroying the larvæ.

(2) The soil of the vineyard and adjoining areas should be cultivated rather deeply to destroy the pupæ.

(3) The vineyard should be sprayed, as the first beetles are seen, with a sweetened poison spray made as follows: Water, 50 gallons; molasses, 2 quarts; arsenate of lead, powder, 3 pounds, or paste, 6 pounds. It is sometimes necessary to spray a second time if the attack is serious.

The grape leaf hopper is a small, light yellow insect and very active. It feeds on the under surface of the leaves, causing them to change to a light yellowish color. The insects hibernate as adults under trash and fallen leaves about the vineyard or near-by fence rows, and clearing up and destroying all such trash is one of the most approved methods of keeping it in check. In addition, the vines should be sprayed with nicotine sulphate at the rate of one-fourth pint to 50 gallons of water. Or the nicotine may be combined with the Bordeaux in spraying for diseases.

Harvesting and Marketing.

Grapes should never be picked until they are fully ripe. There is no other fruit of which this is so emphatically true, since they do not improve at all after they are picked from the vines. Moreover, it is more difficult to tell when grapes are in the best condition for picking than with most other fruits, since color is by no means a sure indication of ripeness, many varieties being well colored long before they are ripe. And the poorer a variety is in quality the more imperative it is

to get all the quality possible into it before picking. The only safe way is, therefore, to test the matter by eating a few berries.

The bunches are usually cut from the vines with a special type of shears with curved jaws. If these are not available a knife with a hooked blade may be substituted. The fruit may be packed in the vineyard directly into the baskets in which it is to be sold, but is more commonly placed upon shallow trays and taken to the packing house, where it is allowed to wilt for a few hours before packing. This decreases considerably the liability of breaking either clusters or berries, and prevents shrinkage in the package, so that the baskets are full when they arrive on the market.

For a package the Climax basket in several sizes is in almost universal use, the 5 and 10 pound sizes being most common. For a strictly local trade the so-called till basket is sometimes used, and is very satisfactory, though having no handle it is not quite so convenient for the purchaser.

Before the bunches are placed in the baskets they should be examined, and all immature and broken berries removed, using a special type of shears with long, tapering blades for the purpose. They are then placed in the baskets, using especial care to have the top layer of the basket attractive, but being equally certain that the clusters in the bottom are fully as good. The baskets are filled slightly above the level of the top to insure a full package, but not so much so that the grapes are damaged. In a strictly local trade, such as much of the marketing in Massachusetts would be, the baskets may often be marketed without any covers, in which case they may be filled fuller and are more attractive. Another essential point, in both the harvesting and the packing of grapes, is to handle them just as little as possible, so that the bloom may not be rubbed off.

Grapes may also be utilized in the making of many products, such as jelly, butter and grape juice, all of which make most delicious additions to the family table, and which might well be manufactured for sale. As a matter of fact, the average family, once the members have been introduced to these products, will consume far more grapes in this form than in a fresh state.

Storing Grapes.

Grapes may be stored for family use or for local market with fair success if a few precautions are observed. The most important of these conditions for successful storage are the following: —

1. To choose the right varieties. As a rule, some admixture of European blood is necessary to insure good keeping of a variety. Of those discussed, the Rogers' Hybrids are likely to be best, with Herbert, Agawam and Barry as perhaps the leaders.
2. To have good, sound, well-matured grapes, but not over ripe.
3. To handle them very carefully indeed.
4. To store in a dry, well-ventilated room, keeping the temperature about 45°, and not allowing it to fluctuate much.